THE GENUS *ATYSA* BALY IN AUSTRALIA (COLEOPTERA: CHRYSOMELIDAE: GALERUCINAE)

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Abstract

The genus *Atysa* Baly is identified and the two Australian species described: *A. kaantju* sp. n. and *A. storeyi* sp. n. In Australia, *Atysa* is restricted to the northern tropics of Queensland, where at least one species feeds on *Ficus* (Moraceae).

Introduction

Leaf beetles of the tribe Galerucini, subfamily Galerucinae, are only moderately diverse in Australia, with approximately 26 genera known (Reid 2003). This total is modest compared with adjacent areas, such as Indochina (approximately 100 genera: Kimoto 1989) and New Guinea (approximately 60 genera: Shute 1983). A key to the Australian genera of Galerucini was recently published, in which *Atysa* Baly was added to the fauna but without description (Reid 2003). This paper describes the two Australian species of this genus.

Atysa was described for a single New Guinean species and compared with *Galeruca* Muller, characterised by a broadly depressed pronotum, densely punctured and pubescent elytra, and narrow body form (Baly 1864). The inadequate description was somewhat rectified by Chapuis (1874), who based a subtribe on the genus, defined by possession of gracile antennae, well-developed epipleura, bifid claws, and simple tibiae, without external grooves or spurs. He also noted the characteristic narrow body shape, with marked difference in width between the prothorax and elytra. However, this definition is also too broad for comparison with modern generic concepts in the Galerucinae and *Atysa* has steadily accumulated species, many of which have diverged greatly from the type.

Wilcox (1971) provided a world catalogue, with 16 species, from Pakistan to New Guinea. Since then, five new species have been described (Chen 1978, Medvedev 2005a, b), three species added from other genera (Medvedev 2005a) and three species removed to other genera (Mohamedsaid 2004, Medvedev 2005a), resulting in a net total of 21 species. However, it is likely that at least some of the species recently placed in *Atysa* do not belong there. For example, *Atysa* was defined by Kimoto (1989) and Mohamedsaid (1993) by having closed procoxal cavities, but these are wide open in the type species, *A. terminalis* Baly. Species included in *Atysa* by Medvedev (2005a) have entirely carinate lateral pronotal borders, which are absent in *A. terminalis*. Maulik (1936) and Shute (1983), who both examined the holotype of *A. terminalis*, correctly identified *Atysa* in keys to Indian and New Guinean genera of Galerucini. We have also examined this specimen.

Apart from minor details (*e.g.* colour, density of sculpture), the Australian species are similar to *A. terminalis* and there is no doubt that they are congeneric. These species all occur in the same biogeographic region, as *A. terminalis* was described from Pulau Misool (Mysol Island) in the shallow sea west of New Guinea.

Specimen repositories are: Australian Museum, Sydney (AMS); Australian National Insect Collection, Canberra (ANIC); Museum of Victoria, Melbourne (MVM); Natural History Museum, London (BMNH); Queensland Museum, Brisbane (QMB); Queensland Department of Primary Industries, Mareeba (QDPIM); South Australian Museum, Adelaide (SAM).

Atysa Baly, 1864

Type species: *Atysa terminalis* Baly, 1864, by monotypy.

Generic diagnosis. The following diagnostic description is based on the Australian species only, but it also applies to the four New Guinean species in AMS. Body form elongate, length *ca* 2.3 x width, elytra almost parallel-sided, width almost 2 x width pronotum and head. Densely punctured (interspaces < puncture diameters) and setose on vertex, pronotal disc and elytra, densely setose on thoracic ventrites and legs.

Head. Vertex with deep longitudinal median groove; frontoclypeus transversely thickened anterior to antennae and eyes, with approximately 90° profile; interantennal space less than 1 socket diameter, with median groove, sockets approximately level with middle of eyes and separated from them; gena 0.2-0.3 x eye length; post-antennal tubercles distinct, base truncate, apex acute; labrum with >5 pairs of discal setae, apical margin convex; all antennomeres elongate, 3 longest, 8-11 relatively thin; apical maxillary palpomere conical, shorter and narrower than preapical.

Thorax. Sides of pronotum evenly convex to shallowly sinuate, constricted in basal half; pronotal disc with pair of large deep lateral depressions, without median groove; anterior and posterior angles each with trichobothrium, posterior pair projecting laterally; pronotum with distinct raised border present anteriorly, weak or absent basally, absent laterally; prosternal process blade-like, not elevated between coxae which are almost touching; procoxal cavities broadly open, gap about length of hypomeral process; elytra covering abdomen, subparallel or slightly expanded from humeri to 3/4 length, non-striate, non-carinate, without transverse posthumeral depression; sides of elytra almost vertical, with narrow ridge beside dorsal margin of epipleuron; epipleuron distinct, gradually narrowed from base to apex; fully winged; mesoventrite not covered by metaventrite, apex acutely pointed; mid coxae separated by much less than width of coxa; femora almost parallel-sided; tibiae without apical spurs in either sex; length hind tarsus *ca* 0.6 x length hind tibia; first hind tarsomere as long as 2+3; tarsal claws bifid, inner tooth almost as long as outer.

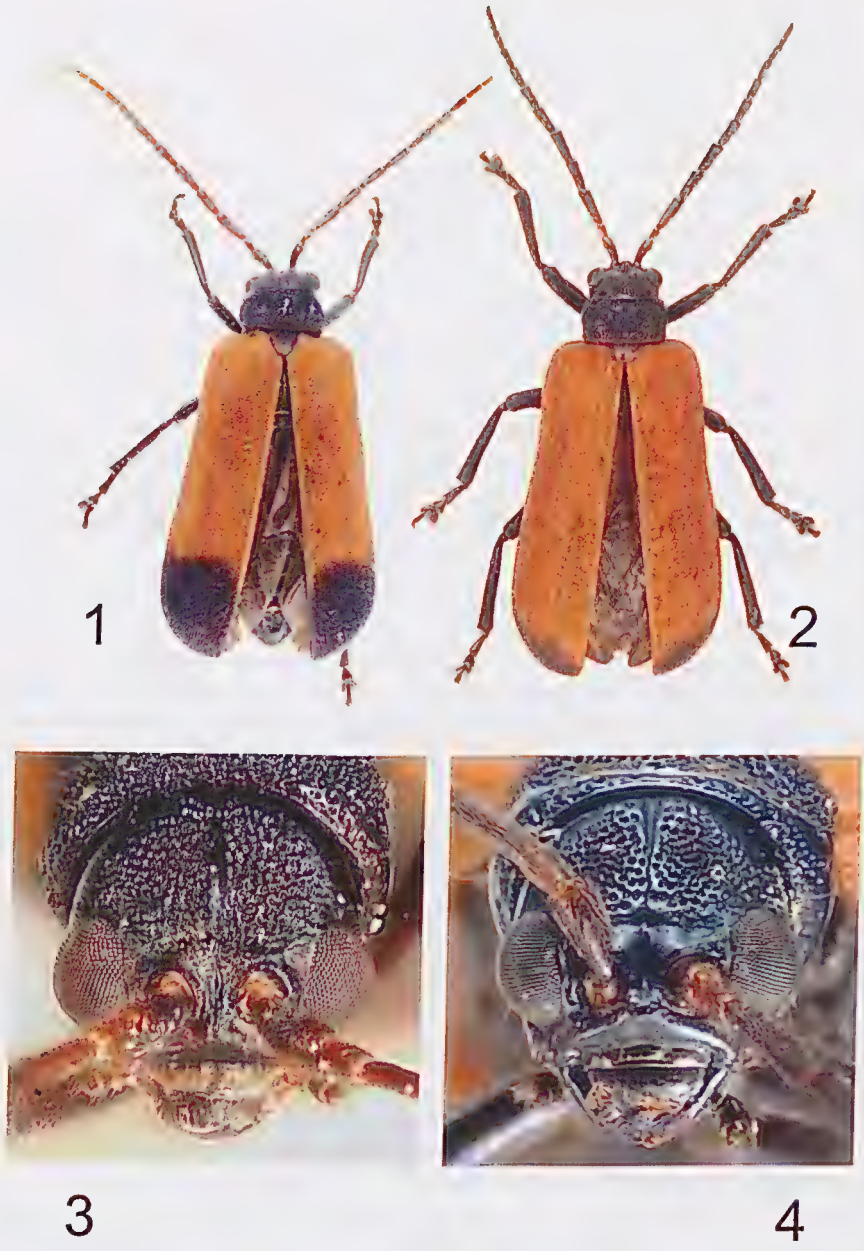
Abdomen. Ventrites not bordered; last ventrite of male with concave excavation of hind margin; penis almost symmetrical, apex entire, base without recurved lobes; ovipositor with well-developed spiculum on sternite 8, palpi fused to a single thickened setose plate; spermathecal receptaculum with globular base and narrow c-shaped apex.

Remarks. The thick plate ('vaginal sclerite') formed by fusion of the vaginal palpi in the ovipositor of *Atysa* is unique among Chrysomelidae examined by CAMR. This is presumably derived from the one-segmented but separate palpi found in typical Galerucini (for example in *Menippus* Clark: Reid and Nally 2008). A similar single plate exists in some epilachnine Coccinellidae (A. Slipinski, pers. comm.), which may also lay their eggs upright in batches. The pronotum of Australian species of *Atysa* was wrongly described as partially laterally margined (Reid 2001, 2003). It is unmargined, in the sense that there is no raised ridge between the trichobothria, but there is an abrupt change from dense punctation on the disc to the smooth hypomeron and the line of punctures may appear to create a bevelled edge in some specimens. This error of interpretation does not significantly affect the identification of *Atysa* in the key to Australian Galerucini (Reid 2003).

Atysa is the type genus of a subtribe of Galerucinae in the old sense, a separate subfamily from Alticinae (Chapuis 1874, Seeno and Wilcox 1982). Synonymy of these subfamilies (Reid 2000) reduces all former subtribes to genus-groups. The genus-group *Atysa* belongs to the subtribe Galerucina, characterised by adults that are usually heavily punctate and pubescent, with narrow prosternal processes, wide open procoxal cavities and externally feeding larvae. Secondary closure of the procoxal cavities may occur by overlap of the hypomera, for example in the type genus *Galeruca* Müller, or the Austro-Papuan genus *Menippus* Clark (Reid and Nally 2008). Within Galerucina, *Atysa* is similar to *Poneridia*, as suggested by Shute (1983), differing mainly by size of eyes, density of elytral punctures and colour. Both genera include species that feed on *Ficus* (McKeown 1942, Novotny *et al.* 1999).

The genus *Atysa* is probably most diverse in New Guinea, where there are at least 10 species (6 described and 4 others seen in collections). Three species have been recorded from a single site in New Guinea (Novotny *et al.* 1999). The described New Guinea species with bicolored elytra (*A. affinis* Jacoby, 1894, *A. jansoni* Baly, 1886) show different colour patterns from the Australian species and are geographically distant (from Aru, Manokwari, Misool and Waigeo, all in far west New Guinea). The undescribed bicoloured species from New Guinea, that we have seen, all differ structurally from the Australian species. It seems reasonable to assume, therefore, that the two Australian species are undescribed and endemic to Australia.

Atysa species have narrow bodies and are generally brightly coloured in highly contrasting red and black or purple and black. They seem to be



Figs 1-4. Habitus and anterior view of head of *Atysa* spp. (1, 3) *A. kaantju* sp. n.; (2, 4) *A. storeyi* sp. n.

involved in mimicry complexes with other Galerucini, Lycidae and other Coleoptera. Two of the specimens studied here were labelled 'Lycidae new genus'.

Several unrelated hostplants are recorded for *Atysa* (Jolivet 1987, Lee and Cheng 2007). However, these records lack detailed observations, or may refer to misidentified species, or are for species erroneously placed in this genus. For example, *A. cinnamomi* Chen, recorded on *Cinnamomum camphora* (Lauraceae), seems misplaced in *Atysa* as it has complete pronotal margins (Chen 1978). Other asiatic species feeding on Lauraceae appear to be similar (Lee and Cheng 2007), but we have not examined material. Novotny *et al.* (1999) listed three New Guinean species on *Ficus* (Moraceae) and this host is corroborated by observations by CAMR of *Atysa storeyi* feeding on *Ficus septica*.

Larvae of *Atysa* are external and leaf-feeding (Novotny *et al.* 1999), like other Galerucina. Eggs are probably laid in compact masses on leaf lamina, as in *Poneridia* (McKeown 1942). Two dissected females of *A. storeyi* included *ca* 20 sculptured ovoid eggs in their oviducts, suggesting that they are laid in batches.

Key to *Atysa* species in Australia

1 Anterior of pronotum with sparse punctures, contrasting strongly with densely punctured remainder; dark apex of elytra *ca* 0.2 x length of elytra; female last ventrite without apical notch ..... *storeyi* sp. n.

- Anterior of pronotum densely punctured; dark apex of elytra *ca* 0.3 x length of elytra; female last ventrite distinctly notched ..... *kaantju* sp. n.

***Atysa kaantju* sp. n.**

(Figs 1, 3, 5, 7, 9, 11, 13)

Types. *Holotype* ♀, QUEENSLAND: Coen District, Cape York, H. Hacker (SAM). *Paratypes* (3): 1 ♀, same data as holotype (SAM); 1 ♂, 1 ♀, ditto except no collector indicated (MVM).

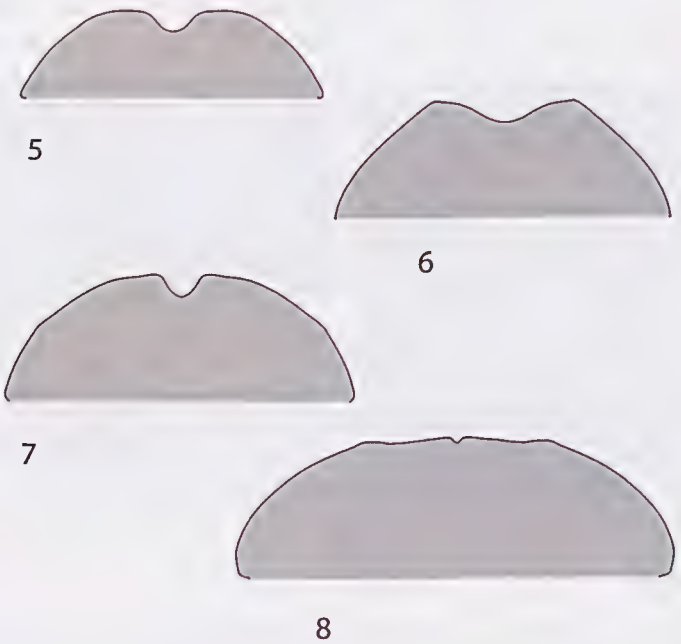
Description. Length: 6 mm (male), 6.5-7.0 mm (female). Colour: black with slight purplish-blue reflection, antennae brownish-red, pronotal angles, scutellum, mesoventrite and legs dark reddish-brown, basal 2/3 of elytra reddish-orange; male specimen teneral, black areas replaced by reddish-brown. Sculpture: vertex, pronotum and elytra densely punctured, intervals sharply ridged, and microsculptured, dull, pronotal punctures largest, elytral smallest; dorsal punctures on head, pronotum and elytra setose, setae short and recumbent.

Head (Figs 1, 3): vertex, except narrow midline, with median circular patch of dense punctures; sides of head and anterior of frontoclypeal ridge smooth, without microsculpture, glabrous and impunctate, except fringe of setae around eyes; postantennal tubercles weakly demarcated, with punctate inner

margins; eyes separated by *ca* 2.5 x eye-widths; antennae 3/4 body length, relative lengths of antennomeres: 2, <9=10, <8=11, <7, <1=4=5=6, <3 (female: male 1-6 same, remainder missing), length first antennomere 2 x second; antennomeres not distinctly flattened.

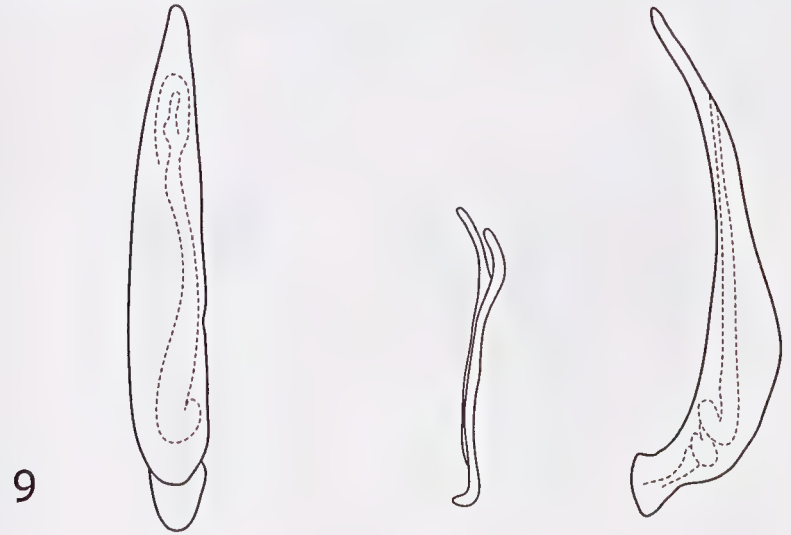
Thorax (Figs 1, 3): pronotal lateral margins sinuate, slightly constricted before base; pronotal punctures dense throughout except small elongate strip at middle, discal punctures tending to coalesce and separated by sharp ridges; lateral pronotal depressions deep, with or without shallow depressions at anterior and base of midline; hind margin slightly medially concave; hypomera smooth and shining, impunctate; scutellum densely punctured, semi-oblong, apex convex; elytral punctures dense throughout, including epipleura; all femora similar-sized; tibiae not sexually dimorphic, densely setose except external face with narrow glabrous ridge.

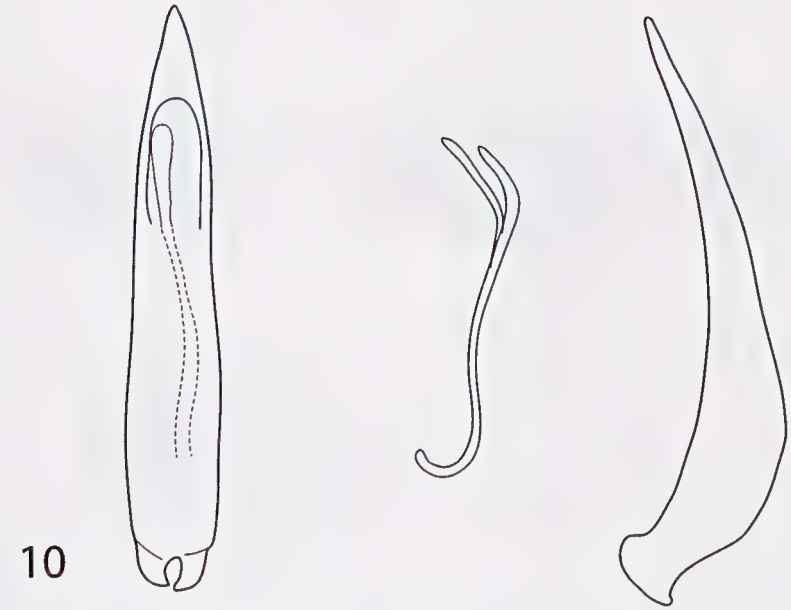
Abdomen (Figs 5, 7, 9, 11): apex of last male ventrite with a large semicircular excision; apex of last female ventrite with small U-shaped excision; tegmen with short basal hook; penis with rounded tip in dorsal view, abruptly narrowed from middle to apex in lateral view; female sternite 8 quadrate with long thin spiculum at base; fused vaginal palpi forming a small setose sclerite; basal swelling of spermathecal receptaculum small compared with apical lobe.



Figs 5-8. Apex of abdominal sternite 7 of *Atysa* spp. (5) male *A. kaantju* sp. n.; (6) male *A. storeyi* sp. n.; (7) female *A. kaantju* sp. n.; (8) female *A. storeyi* sp. n.

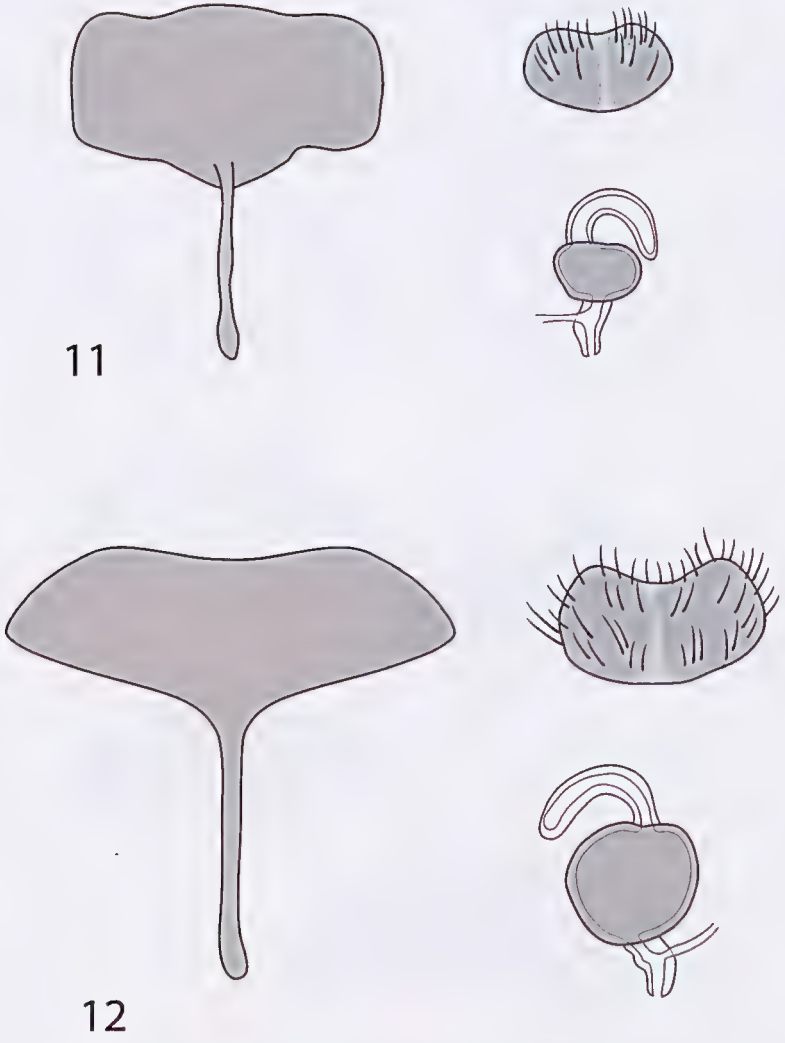
Etymology. A noun in apposition, named for the local language in the Coen area, Kaantju (Horton 2009).





Figs 9-10. Dorsal and lateral views of penis and lateral view of tegmen of *Atysa* spp. (9) *A. kaantju* sp. n.; (10) *Atysa storeyi* sp. n.

Remarks. The male paratype is slightly teneral, with shrivelled abdomen and yellow rather than red elytra, and lacks antennomeres 7-11. There are two undescribed species with similar colour pattern in material from Papua New Guinea (AMS). One, from the Port Moresby area, differs by having thicker black antennae and less dense pronotal punctures. The other, from Mount Lamington, has the pronotal surface more rugose, with larger punctures.



Figs 11-12. Female genitalic structures of *Atysa* spp., including sternite 8, vaginal sclerite (fused palpi) and spermatheca. (11) *A. kaantju* sp. n.; (12) *A. storeyi* sp. n.

Atysa kaantju is known only from early 20th century specimens labelled 'Coen District' (Fig. 13). The collector, Henry Hacker, later the entomologist at the Queensland Museum, visited the area in 1904 with gold prospecting his main intention (Marks and Dahms 1974). The Coen township is in dry open forest (G. Monteith pers. comm.) but 10-15 km east are rainforest-clad western slopes of the McIlwraith Range, where there were several active goldfields in the 1900s (Jack 1921). Given the rainforest association of other *Atysa* species, it is likely that the type series was collected there. Its biology is unknown.

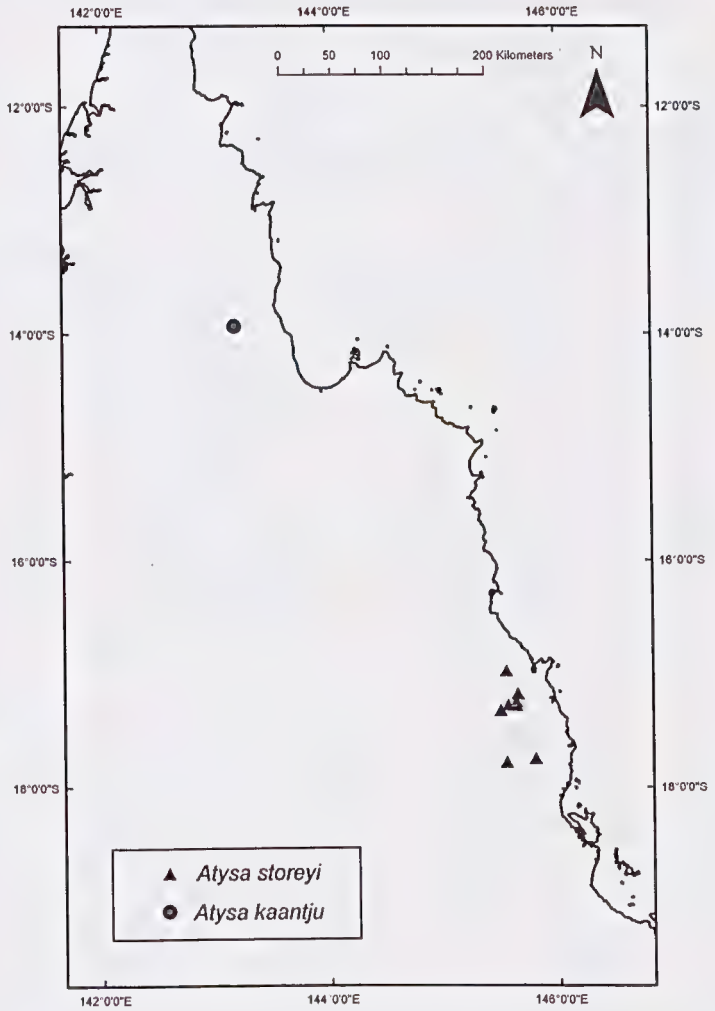


Fig. 13. Distribution of *Atysa* species in northern Queensland: ● = *A. kaantju* sp. n.; ▲ = *A. storeyi* sp. n.

Atysa storeyi sp. n.

(Figs 2, 4, 6, 8, 10, 12, 13)

Types. Holotype ♂, QUEENSLAND: Wongabel SF, 10 km S Atherton, infesting *Ficus septica*, 12.vi.1992, C. Reid (ANIC). *Paratypes* (39): 2 ♂♂, same data as holotype (ANIC); 4 ♀♀, ditto, except: beating *Ficus septica* (ANIC); 1 ♂, 2 ♀♀, Cairns dist[rict]., A.M. Lea (SAM); 1 ♂, 2 ♀♀, Cairns (SAM); 3 ♂♂, 1 ♀, Cathedral Fig, Danbulla SF, on *Ficus septica*, 25.vi.1992, C. Reid (AMS); 4 ♂♂, 3 ♀♀, Cathedral Fig, 17°11'S, 145°39'E, 750 m, ex *Ficus*, 12.v.2007, G. Monteith (QMB); 2 ♀♀, Curtain Fig, 17°17'S, 145°34'E, rainforest by tower, *ca* 800 m, iii.1996, C. Reid (ANIC); 2 ♂♂, 2 ♀♀, Davies Creek, via Mareeba, rainforest 12.vi.1980, G.B. Monteith (QMB); 1 ♀, Davies Ck Rd, Mareeba, 1.ii.1982, R.I. Storey (QDPIM); 1 ♀, Gillies H'way, via Yungaburra, ix.1986, K. Halfpapp (QDPIM); 2 ♀♀, Lake Barrine, 14.vi.1939, J Turner (QMB); 1 ♀, Lake Eacham, 20.v.1982 (QMB); 1 ♀, Tully Falls SF, 18 km SSW Ravenshoe, 730 m, malaise, 5.xi-7.xii.1987, Storey & Dickinson (QDPIM); 1 ♀, Walter Hill Ra., summit, Cardstone-Ravenshoe Rd, 16.i.1967, D. McAlpine, G. Holloway (AMS); 1 ♀, Wongabel SF, 5 k S Atherton, 800 m, 5.xii.1988 Monteith & Thompson (QMB); 1 ♂, 1 ♀, Wongabel SF, via Atherton, 26-27.iii.1992, Storey, DeFaveri (QDPIM).

Description. Length: 6.5-7.5 mm (male), 7.5-9.0 mm (female). Colour: black with slight purplish-blue reflection, antennae and tarsi dark reddish-brown, antennomere 2 often paler, scutellum and mesoventrite yellowish-brown, and legs dark reddish-brown, basal 4/5 of elytra reddish-orange. Sculpture: vertex, pronotum and elytra densely punctured, intervals ridged but some ridges flattened not sharp, and microsculptured, dull, pronotal punctures largest, elytral smallest; dorsal punctures on head, pronotum and elytra setose, setae short and recumbent.

Head (Figs 2, 4): vertex, except narrow midline, with median circular patch of dense punctures; sides of head and anterior of frontoclypeal ridge smooth, without microsculpture, glabrous and impunctate, except fringe of setae around eyes; postantennal tubercles clearly defined, glabrous or with punctate inner margins; eyes separated by *ca* 2.5 x eye-widths; antennae 4/5 (male) to 3/4 (female) body length, relative lengths of antennomeres: 2, <10, <8=9=11, <7, <1=6, <4=5, <3, length first antennomere 2 x second; antennomeres 3-6 slightly flattened.

Thorax (Figs 2, 4): prothoracic shape variable, sides sinuate to rounded, broadest in anterior third; pronotal punctures dense on basal ¾, larger but sparse on apical quarter, discal punctures tending to coalesce; lateral pronotal depressions deep, with shallow depression at base of midline, sometimes also anterior; hind margin slightly medially concave; hypomera smooth and shining, impunctate; scutellum densely punctured, semi-oblong, apex depressed and slightly concave; elytral punctures dense throughout, including epipleura; all femora similar-sized; tibiae not sexually dimorphic, densely setose, external face without ridge.

Abdomen (Figs 6, 8, 10, 12): apex of last male ventrite broadly and shallowly emarginate; apex of last female ventrite with minute median concavity; tegmen with long basal hook; penis with acute tip in dorsal view, evenly narrowed from middle to apex in lateral view; female sternite 8 strongly transverse with long thin spiculum at base; fused vaginal palpi forming a small setose sclerite; basal swelling of spermathecal receptaculum large compared with apical lobe.

Etymology. Named for Ross Storey. CAMR only really knew Ross in his later years, when he was wheelchair bound, but frequently visited him in the 90s, enjoying many yarns over a good whisky. Ross' passionate interest and involvement in beetles was inspirational.

Remarks. *Atysa storeyi* is confined to the Atherton Tableland region of tropical Queensland, from Tully Falls in the south to Davies Creek in the north, at 600-850 m elevation (Fig. 13). *Atysa storeyi* has been collected in almost every month, but most specimens in May and June and this appears to be a primarily winter active species. The species was collected feeding on leaves of *Ficus septica* (Moraceae) at two localities near Atherton. *Ficus septica* is a common rainforest tree in northern Queensland and the western Pacific, from 0-1000 m altitude (Hyland and Whiffin 1993), so the beetle occupies only a small part of the plant's range.

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